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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/820,114	Applicant(s) CHANG, CHING-WEI	
	Examiner James A. Thompson	Art Unit 2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 03 April 2006 have been fully considered but they are not persuasive.

Regarding page 7, lines 2-11: In this section of Applicant's arguments, Applicant appears to be objecting to the age of the references. Firstly, it is not clear how patents which respectively issued on 06 June 2000 (about 10 *months* prior to the filing date of the present application) and 22 September 1998 (2.5 years prior to the filing date of the present application) could be considered "issued long before the filing of this Application." Secondly, even if such a clearly unfounded characterization were accepted, the issue at hand is whether or not the prior art actually teaches the recited claims, not how old the references might be.

Regarding page 7, line 12 to page 9, line 1: Examiner has fully considered Applicant's discussion of the present invention and characterization of the applied prior art.

Regarding page 9, lines 3-18: Hanyu (US Patent 5,812,742) clearly relates to halftone image data. As is abundantly well-known in the art, halftoning involves the printing of dots to create the illusion of gray levels. The dots which Applicant mischaracterizes as "bi-tonal" are simply the dots that result from the halftone process (figure 5A and column 8, lines 7-11 and lines 19-39 of Hanyu). So, the first generation image is clearly a halftone image, and there is no destruction of the utility of the method taught by Hanyu, as alleged by Applicant. Furthermore, Hanyu clearly teaches a second generation halftone image (column 9, lines 51-67 of Hanyu).

Regarding page 9, line 19 to page 10, line 4: Applicant's arguments presented in this section appear to be wholly unrelated to the actual rejection presented. The combination of Hanyu and Sano (US Patent 6,072,590) is not inoperable. Examiner is not sure why Applicant is arguing with respect to the elimination of the halftone screen angle and the supercell of Sano, since this does not appear to be relevant to the outstanding rejections. Furthermore, Applicant is reminded that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). This would appear to be what Applicant is arguing, but it is not completely clear from the unrelated arguments presented in this section of Applicant's arguments.

Regarding page 10, lines 5-6: This section of Applicant's present arguments appears to relate solely to a word search of Karlsson (US Patent 5,777,757), but does not address the rejections set forth in the previous office action, dated 03 January 2006 and mailed 12 January 2006.

Regarding page 10, line 7 to page 11, line 11: As clearly set forth above and in said previous office action, the "two-toned" image data is in fact multi-level halftone data. Halftone image data is, by its very nature, composed of regions that have dots that are either printed or not printed, thus giving the illusion of gray levels to a human viewer. Hanyu clearly teaches that both the first generation (figure 5A and column 8, lines 7-

11 and lines 19-39 of Hanyu) and second generation images (column 9, lines 51-67 of Hanyu) are multi-level halftone images. Furthermore, taking the average of bitonal pixels does, in fact, generate the requisite tone levels since, as is well-known, a multi-level halftone image is only a collection of bitonal dots that give the illusion of multiple tone levels. A "bitonal halftone image", in the sense presented by Applicant, is a contradiction in terms since a halftone image is inherently multi-level.

Regarding page 11, line 12 to page 12, line 8: The scanning itself retains the original first generation halftone image. Though jaggy smoothing and magnification may occur after scanning, and jaggy smoothing and magnification are not themselves a part of the scanning of the first halftone image.

Regarding page 12, lines 9-15: While the additional elements of Sano that were not relied upon by Examiner may also not be relevant to the present application, this in no way requires that Examiner "rip out" those teachings from the Sano reference. Furthermore, a proper question in an analysis of obviousness is whether or not the proposed modification set forth in the rejection would render the prior art unsatisfactory for its intended purpose (see MPEP §2143(V)). Applicant's discussion with respect to the alleged inoperability of Sano is a rather novel, and unsupported, analysis with respect to obviousness under 35 USC §103(a).

Furthermore, Applicant appears to be attempting to require a full bodily incorporation of the Sano reference into the teachings of Hanyu. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the

claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Regarding page 12, line 16 to page 13, line 6: The fact that Hanyu deals with multi-level halftone imaging and converting a first generation halftone image into a second generation halftone image has already been exhaustively established above. It is not at all significant that a mere word search of Hanyu and Sano did not result in hits for the terms "second generation", "interference" or "moirè" since the relevant issue is a matter of technical disclosure, and is not an issue of whether or not Applicant's specifically selected keywords are present or whether or not the present claims are exactly quoted within the references. Furthermore, by seemingly attempting to insist that the primary reference explicitly teach each and every aspect of the claims, Applicant would appear to be attempting to eliminate any possibility of a rejection under 35 USC §103(a). Throughout all of Applicant's arguments presented up to this point, Applicant has failed to address the actual combination of references set forth in said previous office action.

Regarding page 13, line 7: Since claim 1 is clearly obvious over Hanyu in view of Sano, claims 2-5 are not allowable merely due to their dependence from claim 1.

Regarding page 13, lines 8-19: As is clearly set forth in said previous office action, the number of gray levels is based on the number of potentially printed dots in an array. The averaging technique mentioned by Applicant is not addressed in Examiner's rejection of claim 6. The scaling up (also known as

"magnification" in Hanyu) operations specifically shown (column 9, lines 51-53 and column 10, lines 1-7 of Hanyu) are simply demonstrative. If the halftone data is magnified such that there are 4x4 dots for each pixel, then the number of tone levels is fifteen levels of gray plus white.

Regarding page 13, line 20: Since claim 1 is clearly obvious over Hanyu in view of Sano, claim 7 is not allowable merely due to its dependence from claim 1.

Regarding page 13, line 21 to page 14, line 12: Applicant applies similar arguments as were applied with respect to the rejection of claim 1. Claim 1 has been demonstrated to be obvious to one of ordinary skill in the art at the time of the invention, and claim 8 would also have been obvious to one of ordinary skill in the art at the time of the invention.

Regarding page 14, line 13: Claim 6 is demonstrated above to be obvious to one of ordinary skill in the art at the time of the invention. Claim 9 is therefore not allowable based on similar arguments.

Regarding page 14, line 14: Since claim 8 has been demonstrated to be obvious to one of ordinary skill in the art at the time of the invention, claims 10-12 are therefore not allowable based only on their ultimate dependency from claim 8.

Regarding page 14, line 15 to page 15, line 4: The cited portion of Hanyu demonstrates that the resulting 2x2 pixels have multiple-tone levels of 0, 0, (1/3)P and (5/6)P. While P itself may be determined from an averaging algorithm, the multiple-tone levels themselves are set with respect to each of the four pixels in a 2x2 pixel array (column 9, lines 60-67 of Hanyu). Each dot in the pixel array is set based on a corresponding 6x6 dot array that is magnified such that the overall 12x12 dot

array becomes a 2x2 dot array. The 2x2 bitonal array forms a pixel with four possible tone levels, determined by the averaging algorithm. Thus, the corresponding thresholds (required to determine if a dot is printed or not) are established for a 2x2 (4-tone) pixel.

Regarding page 15, lines 5-6: Claims 9-12 have already been demonstrated to be obvious over the prior art. Thus, claims 14-17 are not allowable for similar reasons.

Regarding page 15, lines 7-14: As discussed in detail above, second generation halftoning as recited in the present claims is clearly taught by the prior art of record. While the amendments are not significant, the amendments technically require new grounds of rejection. The same prior art is applied against the claims as was applied in said previous office action. Any new grounds of rejection are necessitated by the present amendments to the claims.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanyu (US Patent 5,812,742) in view of Sano (US Patent 6,072,590).

Regarding claim 1: Hanyu discloses selecting an image which has been halftoned by forming original halftone dots (figure 5A and column 8, lines 25-29 of Hanyu), wherein each halftone dot includes at least one pixel therefor (column 7, lines 46-49 and column 8, lines 29-34 of Hanyu); determining a number of tone levels required for each pixel of the selected halftoned image (column 9, lines 36-41 and lines 51-57 of Hanyu); organizing the number of tone levels (figures 6A-6D and column 9, lines 17-35 of Hanyu); and identifying a high frequency halftone cell size (column 9, lines 20-34 of Hanyu). By organizing the dots for the second halftone operation into 1x1, 2x2, 2x4, 3x3 or 3x6 cells, the high-frequency halftone cell size is identified. The high-frequency halftone cell size is the cell size specifically selected based on the desired magnification.

Hanyu further discloses scanning the selected halftoned image (column 7, lines 30-35 and column 11, lines 24-30 of Hanyu) to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein (figure 12(8) and column 9, lines 51-67 of Hanyu). Reading the image with a fax machine to produce the initial multi-level (also know as halftoned) image requires scanning the image. The original halftone image is used to produce a second generation multi-level halftoned image in the system receiving the scanned halftoned image (figure 12(8) and column 9, lines 51-67 of Hanyu).

Hanyu further discloses reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level (column 9, lines 60-67 of Hanyu); and selecting, from the set of tone levels, a tone closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise (column 9, lines 60-67 of Hanyu).

Hanyu does not disclose expressly arranging the number of tone levels in a set of tone levels; that said selection of a tone is performed such that the noise generated during scanning is minimized and without constructing a new halftone center; and arranging a dot growth pattern evenly across the second generation multi-level halftoned image.

Sano discloses arranging the number of tone levels in a set of tone levels (figure 9 and column 5, lines 29-36 of Sano); selecting a tone such that the noise generated during scanning is minimized (figure 14 and column 8, lines 4-8 of Sano) and without constructing a new halftone center (column 7, line 60 to column 8, line 4 of Sano); and a dot growth pattern evenly across the second generation multi-level halftoned image (figure 14(HC0-HC4) and column 7, line 60 to column 8, line 4 of Sano).

Hanyu is analogous art since Hanyu is from the same field of endeavor as the present application, namely converting halftone data to multi-tone data without descreening. Hanyu and Sano are combinable because they are from the same field of endeavor, namely halftone processing of image data so as to minimize halftone processing artifacts. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the halftone screen production and threshold selection processing taught by Sano to produce the halftone screen used for multi-tone image production in the

system taught by Hanyu. The motivation for doing so would have been eliminate unevenness in the resultant multi-tone image (column 2, lines 20-22 of Sano). Therefore, it would have been obvious to combine Sano with Hanyu to obtain the invention as specified in claim 1.

4. Claims 2-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanyu (US Patent 5,812,742) in view of Sano (US Patent 6,072,590) and Karlsson (US Patent 5,777,757).

Regarding claims 2-3: Hanyu in view of Sano does not disclose expressly determining a sub-pixel level difference; and that growing the dot pattern includes growing the dot pattern evenly across the second generation multi-level image by setting the sub-pixel level difference to one.

Karlsson discloses determining a sub-pixel level difference (figure 5 and column 5, line 60 to column 6, line 1 of Karlsson); and growing the dot pattern evenly across the multi-level image by setting the sub-pixel level difference to one (figure 5; column 6, lines 5-11; and column 8, lines 52-62 of Karlsson). Karlsson teaches that the supercell array (figure 5(500) of Karlsson) can be configured in any desired manner and the order of growth can occur in any desired progression of stages (column 8, lines 52-62 of Karlsson). In the example of figure 5 of Karlsson, the order of growth progresses such that, in the left column, each sub-pixel is increased by one grayscale value until all the sub-pixels in the left column are the same value (column 5, line 63 to column 6, line 4 of Karlsson). Then, after all the sub-pixels of the left column have attained the same color, the growth progression repeats, but with the next grayscale level (column 6, lines 5-11 of Karlsson). Therefore, the sub-

pixel level difference has been set to one. Since figures 5-7 of Karlsson are merely exemplary and any configuration and pixel growth can be defined (column 8, lines 52-62 of Karlsson), it would be obvious to one of ordinary skill in the art to apply the growth pattern of the left column of the supercell to the entire supercell. In other words, the progression would occur such that every sub-pixel in the supercell is the same grayscale value before a sub-pixel is set to the next grayscale value.

Hanyu in view of Sano is combinable with Karlsson because they are from the same field of endeavor, namely halftone data image processing and halftone screen production. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the dot growth pattern taught by Karlsson to the second-generation multi-level halftone method taught by Hanyu in view of Sano. The motivation for doing so would have been to reduce image artifacts (column 3, lines 12-16 of Karlsson). Therefore, it would have been obvious to combine Karlsson with Hanyu in view of Sano to obtain the invention as specified in claims 2-3.

Regarding claim 8: Hanyu discloses selecting an image which has been halftoned by forming original halftone dots (figure 5A and column 8, lines 25-29 of Hanyu), wherein each halftone dot includes at least one pixel therefor (column 7, lines 46-49 and column 8, lines 29-34 of Hanyu); determining a number of tone levels required for each pixel of the selected halftoned image (column 9, lines 36-41 and lines 51-57 of Hanyu); organizing the number of tone levels (figures 6A-6D and column 9, lines 17-35 of Hanyu); and identifying a high frequency halftone cell size (column 9, lines 20-34 of Hanyu). By organizing the dots for the second halftone operation into 1x1,

2x2, 2x4, 3x3 or 3x6 cells, the high-frequency halftone cell size is identified. The high-frequency halftone cell size is the cell size specifically selected based on the desired magnification.

Hanyu further discloses scanning the selected halftoned image (column 7, lines 30-35 and column 11, lines 24-30 of Hanyu) to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein (figure 12 (8) and column 9, lines 51-67 of Hanyu). Reading the image with a fax machine to produce the initial halftoned image requires scanning the image. The original halftone image is used to produce a second generation halftoned image in the system receiving the scanned halftoned image (figure 12(8) and column 9, lines 51-67 of Hanyu).

Hanyu further discloses reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level (column 9, lines 60-67 of Hanyu); and selecting, from the set of tone levels, a tone closest to the pixel tone level of each pixel in the second generation multi-level halftoned image (column 9, lines 60-67 of Hanyu).

Hanyu does not disclose expressly arranging the number of tone levels in a set of tone levels; that said selection of a tone level is performed such that the noise generated during scanning is minimized and without constructing a new halftone center; arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells and growing the dot pattern relative to the sub-cell; determining a sub-pixel level difference; and growing a dot pattern evenly across the second generation multi-level half-

toned image by setting the sub-pixel level difference to one while preserving halftone dot original amplitude.

Sano discloses arranging the number of tone levels in a set of tone levels (figure 9 and column 5, lines 29-36 of Sano); selecting a tone such that the noise generated during scanning is minimized (figure 14 and column 8, lines 4-8 of Sano) and without constructing a new halftone center (column 7, line 60 to column 8, line 4 of Sano); and arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells (figure 14(HC0-HC4) of Sano) and growing the dot pattern relative to the sub-cell (column 7, line 60 to column 8, line 4 of Sano).

Hanyu is analogous art since Hanyu is from the same field of endeavor as the present application, namely converting half-tone data to multi-tone data without descreening. Hanyu and Sano are combinable because they are from the same field of endeavor, namely halftone processing of image data so as to minimize halftone processing artifacts. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the halftone screen production and threshold selection processing taught by Sano to produce the halftone screen used for multi-tone image production in the system taught by Hanyu. The motivation for doing so would have been eliminate unevenness in the resultant multi-tone image (column 2, lines 20-22 of Sano). Therefore, it would have been obvious to combine Sano with Hanyu.

Hanyu in view of Sano does not disclose expressly determining a sub-pixel level difference; and growing a dot pattern evenly across the second generation multi-level halftoned image

by setting the sub-pixel level difference to one while preserving halftone dot original amplitude.

Karlsson discloses determining a sub-pixel level difference (figure 5 and column 5, line 60 to column 6, line 1 of Karlsson); and growing the dot pattern evenly across the image by setting the sub-pixel level difference to one while preserving halftone dot original amplitude (figure 5; column 6, lines 5-11; and column 8, lines 52-62 of Karlsson). Karlsson teaches that the supercell array (figure 5(500) of Karlsson) can be configured in any desired manner and the order of growth can occur in any desired progression of stages (column 8, lines 52-62 of Karlsson). In the example of figure 5 of Karlsson, the order of growth progresses such that, in the left column, each sub-pixel is increased by one grayscale value until all the sub-pixels in the left column are the same value (column 5, line 63 to column 6, line 4 of Karlsson). Then, after all the sub-pixels of the left column have attained the same color, the growth progression repeats, but with the next grayscale level (column 6, lines 5-11 of Karlsson). Therefore, the sub-pixel level difference has been set to one. Since figures 5-7 of Karlsson are merely exemplary and any configuration and pixel growth can be defined (column 8, lines 52-62 of Karlsson), it would be obvious to one of ordinary skill in the art to apply the growth pattern of the left column of the supercell to the entire supercell. In other words, the progression would occur such that every sub-pixel in the supercell is the same grayscale value before a sub-pixel is set to the next grayscale value.

Hanyu in view of Sano is combinable with Karlsson because they are from the same field of endeavor, namely halftone data image processing and halftone screen production. At the time of

the invention, it would have been obvious to a person of ordinary skill in the art to apply the dot growth pattern taught by Karlsson to the second-generation halftone method taught by Hanyu in view of Sano. The motivation for doing so would have been to reduce image artifacts (column 3, lines 12-16 of Karlsson). Therefore, it would have been obvious to combine Karlsson with Hanyu in view of Sano to obtain the invention as specified in claim 8.

Regarding claim 13: Hanyu discloses selecting an image which has been halftoned by forming original halftone dots (figure 5A and column 8, lines 25-29 of Hanyu), wherein each halftone dot includes at least one pixel therefor (column 7, lines 46-49 and column 8, lines 29-34 of Hanyu); determining a number of tone levels required for each pixel of the selected halftoned image (column 9, lines 36-41 and lines 51-57 of Hanyu); organizing the number of tone levels (figures 6A-6D and column 9, lines 17-35 of Hanyu); and identifying a high-frequency halftone cell size (column 9, lines 20-34 of Hanyu). By organizing the dots for the second halftone operation into 1x1, 2x2, 2x4, 3x3 or 3x6 cells, the high-frequency halftone cell size is identified. The high-frequency halftone cell size is the cell size specifically selected based on the desired magnification.

Hanyu further discloses scanning the selected halftoned image (column 7, lines 30-35 and column 11, lines 24-30 of Hanyu) to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein (figure 12 (8) and column 9, lines 51-67 of Hanyu). Reading the image with a fax machine to produce the initial halftoned image requires scanning the image. The original

halftone image is used to produce a second generation multi-level halftoned image in the system receiving the scanned halftoned image (figure 12(8) and column 9, lines 51-67 of Hanyu).

Hanyu further discloses reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level by setting multi-level thresholds (column 9, lines 60-67 of Hanyu); and selecting, from the set of tone levels, a tone closest to the pixel tone level of each pixel in the second generation halftoned image to minimize noise (column 9, lines 60-67 of Hanyu).

Hanyu does not disclose expressly arranging the number of tone levels in a set of tone levels; that said selection of a tone is performed such that the noise generated during scanning is minimized and without constructing a new halftone center; arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells and growing the dot pattern relative to the sub-cell; determining a sub-pixel level difference; and growing a dot pattern evenly across the second generation multi-level halftoned image by setting the sub-pixel level difference to one while preserving original dot amplitude.

Sano discloses arranging the number of tone levels in a set of tone levels (figure 9 and column 5, lines 29-36 of Sano); selecting a tone such that the noise generated during scanning is minimized (figure 14 and column 8, lines 4-8 of Sano) and without constructing a new halftone center (column 7, line 60 to column 8, line 4 of Sano); and arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells (figure 14(HC0-HC4) of Sano) and growing

the dot pattern relative to the sub-cell (column 7, line 60 to column 8, line 4 of Sano).

Hanyu is analogous art since Hanyu is from the same field of endeavor as the present application, namely converting half-tone data to multi-tone data without descreening. Hanyu and Sano are combinable because they are from the same field of endeavor, namely halftone processing of image data so as to minimize halftone processing artifacts. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the halftone screen production and threshold selection processing taught by Sano to produce the halftone screen used for multi-tone image production in the system taught by Hanyu. The motivation for doing so would have been eliminate unevenness in the resultant multi-tone image (column 2, lines 20-22 of Sano). Therefore, it would have been obvious to combine Sano with Hanyu.

Hanyu in view of Sano does not disclose expressly determining a sub-pixel level difference; and growing a dot pattern evenly across the second generation multi-level halftoned image by setting the sub-pixel level difference to one while preserving original dot amplitude.

Karlsson discloses determining a sub-pixel level difference (figure 5 and column 5, line 60 to column 6, line 1 of Karlsson); and growing the dot pattern evenly across the image by setting the sub-pixel level difference to one while preserving original dot amplitude (figure 5; column 6, lines 5-11; and column 8, lines 52-62 of Karlsson). Karlsson teaches that the supercell array (figure 5(500) of Karlsson) can be configured in any desired manner and the order of growth can occur in any desired progression of stages (column 8, lines 52-62 of Karls-

son). In the example of figure 5 of Karlsson, the order of growth progresses such that, in the left column, each sub-pixel is increased by one grayscale value until all the sub-pixels in the left column are the same value (column 5, line 63 to column 6, line 4 of Karlsson). Then, after all the sub-pixels of the left column have attained the same color, the growth progression repeats, but with the next grayscale level (column 6, lines 5-11 of Karlsson). Therefore, the sub-pixel level difference has been set to one. Since figures 5-7 of Karlsson are merely exemplary and any configuration and pixel growth can be defined (column 8, lines 52-62 of Karlsson), it would be obvious to one of ordinary skill in the art to apply the growth pattern of the left column of the supercell to the entire supercell. In other words, the progression would occur such that every sub-pixel in the supercell is the same grayscale value before a sub-pixel is set to the next grayscale value.

Hanyu in view of Sano is combinable with Karlsson because they are from the same field of endeavor, namely halftone data image processing and halftone screen production. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the dot growth pattern taught by Karlsson to the second-generation multi-level halftone method taught by Hanyu in view of Sano. The motivation for doing so would have been to reduce image artifacts (column 3, lines 12-16 of Karlsson). Therefore, it would have been obvious to combine Karlsson with Hanyu in view of Sano to obtain the invention as specified in claim 13.

Further regarding claims 4, 11 and 16: Karlsson discloses that said defining a sub-cell includes defining a cell to be a 4x4 pixel matrix (figure 10 and column 8, lines 35-38 of Karls-

son). Karlsson further teaches defining a supercell (figure 9 of Karlsson) comprising four separate sub-cells as a 2D matrix (column 8, lines 25-32 of Karlsson), having a sub-pixel level difference matrix value for each pixel in the cell and sub-cell (column 8, lines 28-34 of Karlsson). Distributing the elements in the classes (column 8, lines 28-34 of Karlsson) determines how the dot pattern is grown (column 5, lines 10-17 of Karlsson). Splitting the supercell into four sub-cells (figure 9 and column 8, lines 25-29 of Karlsson) will result in four sub-cells of 2x2 pixels if performed on the supercell in the example of figure 10 of Karlsson). Further, since the supercell can be configured in any desired manner (column 8, lines 60-62 of Karlsson), the order of each of the sub-cells of figure 10 of Karlsson can be modified such that each 2x2 pixel sub-cell contains 0_x, 1_x, 2_x and 3_x, where 'x' is the integer denoting the order for the particular pixel.

Regarding claims 5, 12 and 17: Hanyu discloses that said arranging includes scaling up the matrix values fro zero to one, to zero to 255 (column 9, lines 51-53 and column 10, lines 1-7 of Hanyu). The scaling up (also known as "magnification" in Hanyu) operations specifically shown are simply demonstrative. If the halftone data is magnified such that there are 16x16 dots for each initial halftone dot, then the scaling up of the matrix values is from zero to one, to zero to 255.

Regarding claims 6, 9 and 14: Hanyu discloses that the number of tone levels is fifteen levels of gray plus white (column 9, lines 51-53 and column 10, lines 1-7 of Hanyu). The scaling up (also known as "magnification" in Hanyu) operations specifically shown are simply demonstrative. If the halftone data is magnified such that there are 4x4 dots for each pixel,

then the number of tone levels is fifteen levels of gray plus white.

Further regarding claims 7, 10 and 15: Karlsson discloses that the cell size is 4x4 pixels (figure 1 and column 4, lines 28-34 of Karlsson).

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be

reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

James A. Thompson
Examiner
Technology Division 2625

08 June 2006

THOMAS D. LEE
PRIMARY EXAMINER